InfoVision Optoelectronics (Kunshan) Co.,LTD.

Document Title	M236MWF2 R0 Product information			Page No.	1/26
Document No.	M236MWF2 R0	Issue date	2011/07/11	Revision	05

IVO Product Information

Product Name: M236MWF2 R0

Note: 1. Please contact InforVision Company. Before designing your product based on this product.
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by IVO for any intellectual property claims or other problems that may result from application based on the module described herein.

FQ-7-30-0-009-03D

Revision	Date	Page	Old Description	New Description	Remark
00	2011/03/17	All		First issued	
01	2011/03/30	11		Add: Backlight connector type: ENTERY 3707K-Q06N-01L	
02	2011/05/12	8		Add: I_{PIN} = 120 mA	
03	2011/06/02	7,16		Add: $I_{DD,}$ $P_{DD,}$ Luminance Uniformity , spec	
04	2011/06/10	16		Fix Color Chromaticity	
05	2011/07/11	all		final	

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1 General Descriptions

1.1 Introduction

The M236MWF2 is a Color Active Matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) module, which uses amorphous Silicon TFT as a switching device. It is composed of a TFT LCD panel, a timing controller, voltage reference, common voltage, column driver, and row driver circuit. This TFT LCD has a 23.6 inch (diagonally measured) active display area with resolution (1,920 vertical by 1,080 horizontal pixel array).

1.2 Features

- 23.6" TFT LCD Panel
- LED Backlight System
- Supports (V:1,920 lines, H:1,080 pixels) Resolution
- Compatible with RoHS and GP Standard
- Compatible with TCO 5.0 Standard

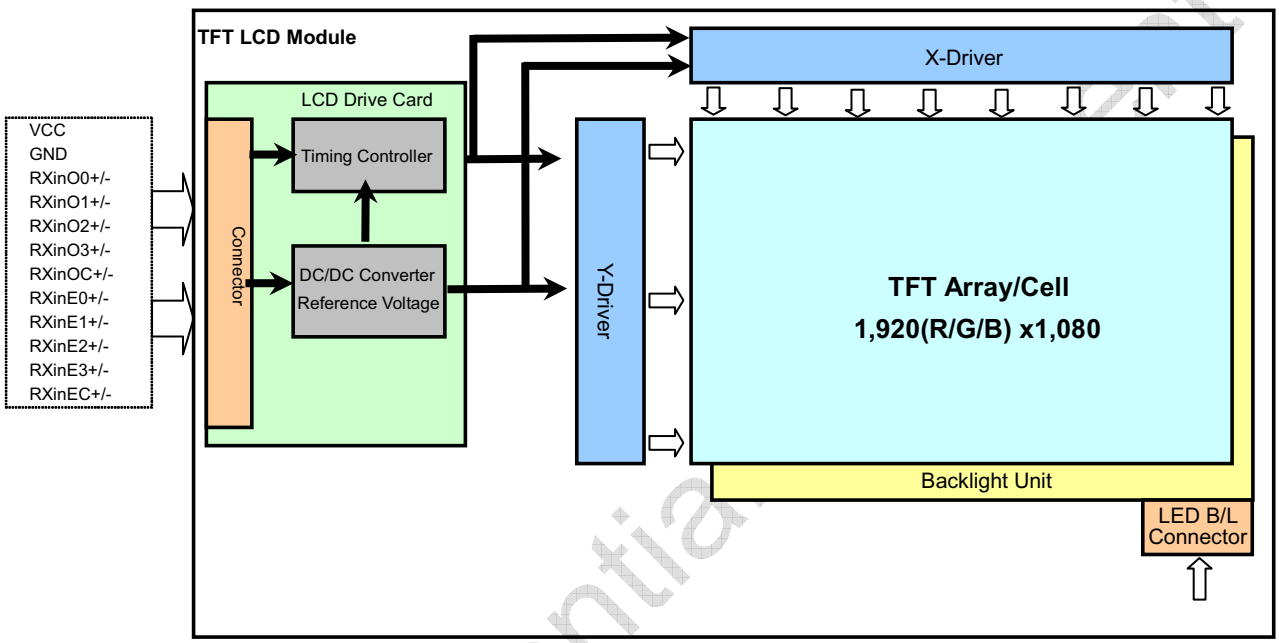
1.3 Product Summary

Items	Specifications	Unit	Remark
Screen Diagonal	23.6	inch	-
Active Area	521.3x293.2	mm	-
Pixels(H x V)	1,920(x3) x1,080	-	-
Pixel Pitch	0.2715x0.2715	mm	-
Pixel Arrangement	R.G.B. Vertical Stripe	-	-
Display Mode	TN Mode, Normally White	-	-
White Luminance	300	cd/ m^2	-
Contrast Ratio	1,000:1	-	-
Response Time	5	ms	-
View Angle(H/V)	170/160	-	-
Input Voltage	+5.0	V	-
Power Consumption	17.7	Watt	-
Module Weight	2,500 (Typ)	g	-
Outline Dimension(H x V x D)	544.8x320.5x11.9(max)	mm	-
Electrical Interface (Logic)	2ch LVDS	-	-
Support Color	16.7M	-	-
NTSC	72 %	%	-
Optimum Viewing Direction	6 o'clock	-	-
Surface Treatment	AG/3H	-	-

1.4 Functional Block Diagram

Figure 1 shows the functional block diagram of the LCD module.

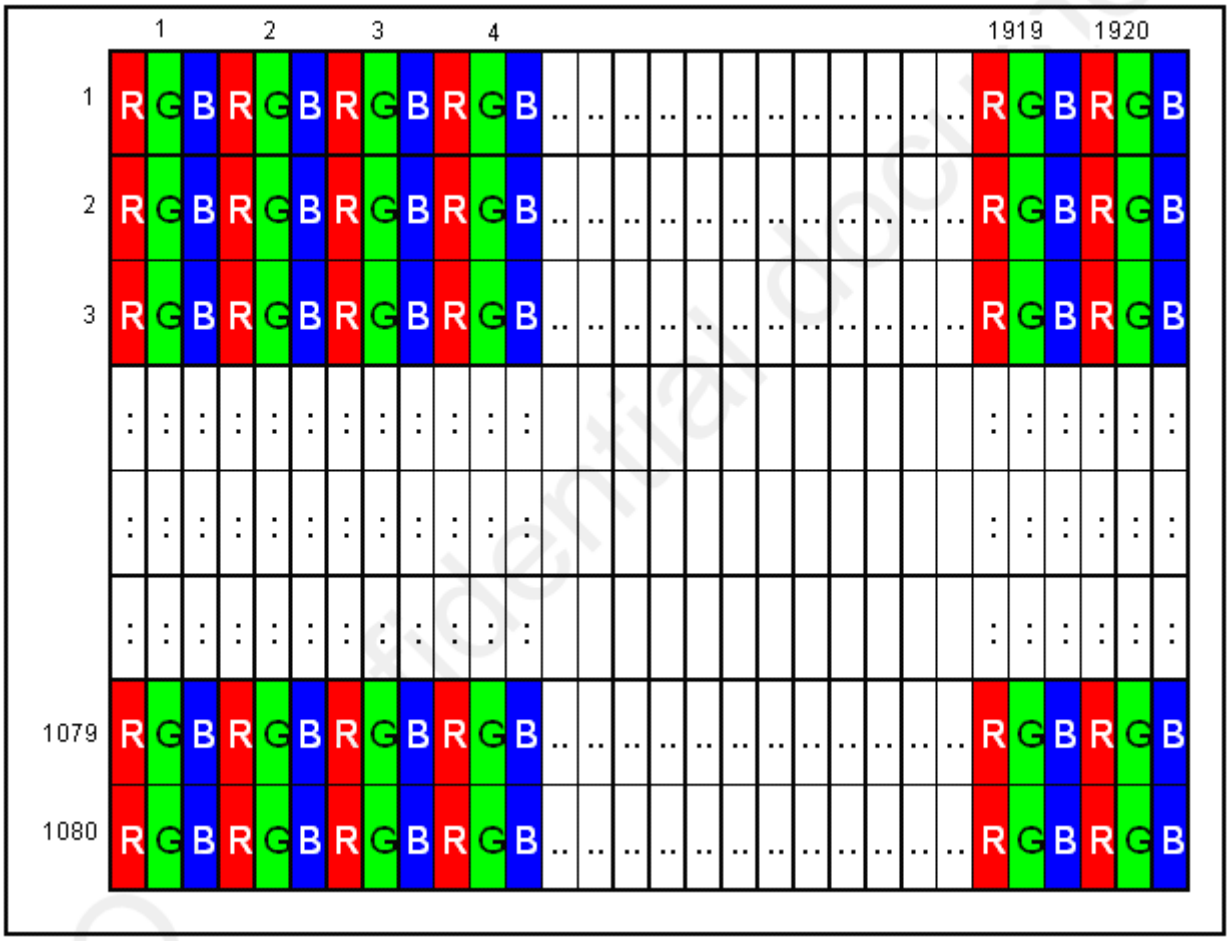
Figure 1 Block Diagram



1.5 Pixel Format Image

Figure 2 shows the relationship of the input signals and LCD pixel format image.

Figure 2 Pixel Format



2 Absolute Maximum Ratings

The followings are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

Table 1

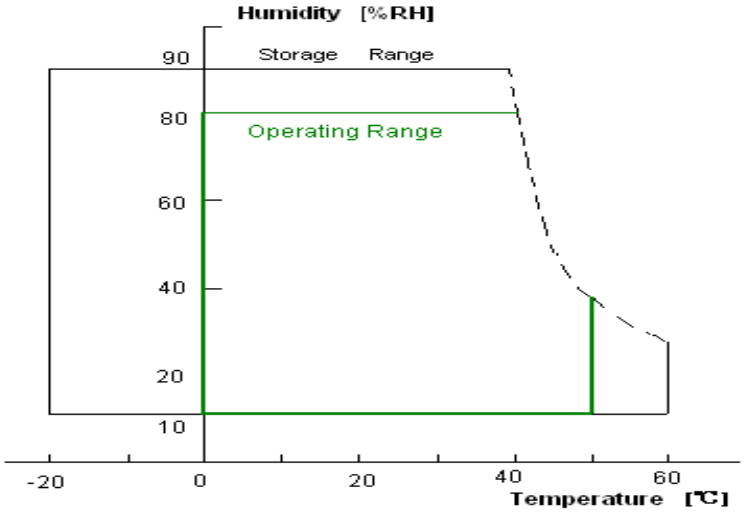
Item	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	V_{DD}	-0.3	6.0	V	-
Input Signal	-	-0.3	2.7	V	LVDS Signals
Operating Temperature	TOP	0	50	℃	Note(3)
Operating Humidity	HOP	10	80	%RH	Note(3)
Storage Temperature	TST	-20	60	℃	Note(3)
Storage Humidity	HST	10	90	%RH	Note(3)
Vibration	Level	-	1.5	G	30min. for X, Y, Z axis
	Bandwidth	-	10～500~10	Hz	
Shock	Level	-	50	G	Half sine waveform, 11ms
LED Current	I_{LED}	-	60	mA	Per LED Chip

Note:

(1)Maximum Wet-Bulb should be 39℃ and No condensation

(2)When you apply the LCD module for OA system, please make sure to keep the temperature of LCD module under 60℃.

(3)Storage /Operating temperature & humidity:



3 Electrical Specification

3.1 Electrical Characteristics

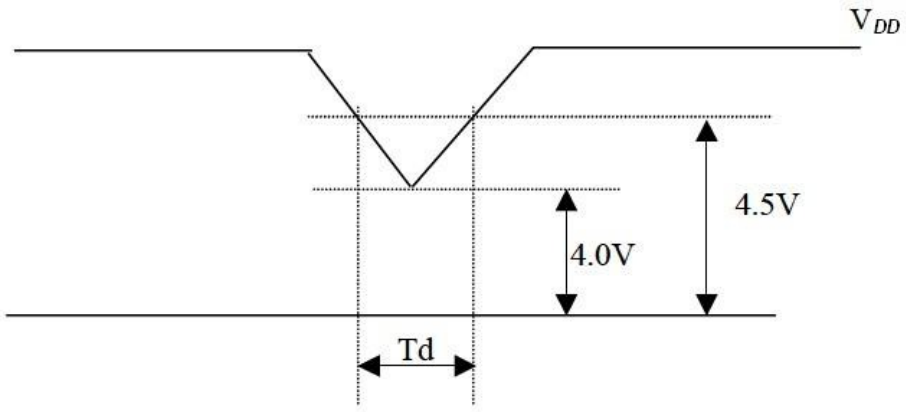
Table 2 Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Condition
V_{DD}	Logic/LCD Drive Voltage	4.5	5.0	5.5	V	Note (1)
I_{DD}	V_{DD} Current	-	770	900	mA	Black Pattern, 60Hz
P_{DD}	V_{DD} Power	-	3.9	4.5	W	Black Pattern, 60Hz
Irush	Rush Current	-	-	2.5	A	Note (2)
$V_{DD}rp$	Allowable Logic/LCD Drive Ripple Voltage	-	-	300	mVp-p	-
$V_{\_LED}$	LED Input	25.2	28.8	31.5	V	-
V_F	LED Forward Voltage	2.8	3.2	3.5	V	-
I_F	LED Forward Current	-	60	-	mA	-
I_{PIN}	LED Light Bar Pin Current	0	120	125	mA	Pin1, Pin2, Pin5 and Pin6 refer to figure 5.
P_{LED}	LED Power Consumption	-	13.8	15.8	W	Note(3)
L_T	LED Life Time	30,000	-	-	Hours	Note(4)

Note:

(1)V_{DD} Power Dip Condition

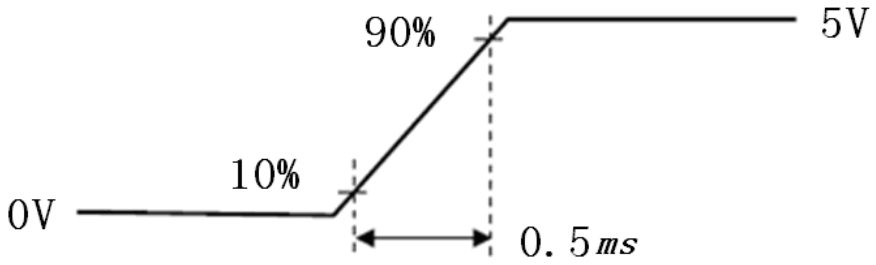
Figure 3 V_{DD} Power Dip



If $V_{TH} < V_{DD} \leq V_{min}$ and $t_d \leq 10ms$, our panel must revive automatically when the voltage returns to normal.

(2)Measure Condition

Figure 4 V_{DD} rising time



(3) P_{LED} is calculation value for reference. P_{LED} =72 x V_F (Normal Distribution) x I_F (Normal Distribution)；LED Light Bar circuit is 4 parallel ,9 series,and each serie has 2 LED chips In parallel.

(4) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25℃ and I_F= 60mA (per chip) until the brightness becomes≦50% of its original value.

(5)All values are measured at condition of I_F =60mA and Ta=25℃.

3.2 Interface Connections

Table 3 LVDS Connector Name / Designation

Manufacturer	Starconn (or equivalent)
Type / Part Number	093G30-B2001A-M4(Starconn)

Table 4 LVDS Signal Pin Assignment

Pin #	Signal Name	Description	Remarks
1	RXinO0-	Negative LVDS differential data input(0)	-
2	RXinO0+	Positive LVDS differential data input(0)	-
3	RXinO1-	Negative LVDS differential data input(1)	-
4	RXinO1+	Positive LVDS differential data input(1)	-
5	RXinO2-	Negative LVDS differential data input(2)	-
6	RXinO2+	Positive LVDS differential data input(2)	-
7	GND	Power Ground	-
8	RXOC-	Negative LVDS differential data input(clock)	-
9	RXOC+	Positive LVDS differential data input(clock)	-
10	RXinO3-	Negative LVDS differential data input(3)	-
11	RXinO3+	Positive LVDS differential data input(3)	-
12	RXinE0-	Negative LVDS differential data input(0)	-
13	RXinE0+	Positive LVDS differential data input(0)	-
14	GND	Power Ground	-
15	RXinE1-	Negative LVDS differential data input(1)	-
16	RXinE1+	Positive LVDS differential data input(1)	-
17	GND	Power Ground	-
18	RXinE2-	Negative LVDS differential data input(2)	-
19	RXinE2+	Positive LVDS differential data input(2)	-
20	RXEC-	Negative LVDS differential data input(clock)	-
21	RXEC+	Positive LVDS differential data input(clock)	-
22	RXinE3-	Negative LVDS differential data input(3)	-
23	RXinE3+	Positive LVDS differential data input(3)	-
24	GND	Power Ground	-
25	NC	No Contact	-
26	BIST	When BIST = HIGH and no any LVDS input signals, the internal pattern generator actives. Keep low for normal operation.	-
27	NC	No Contact	-
28	VDD	Power Supply	5V(Typ.)
29	VDD	Power Supply	5V(Typ.)
30	VDD	Power Supply	5V(Typ.)

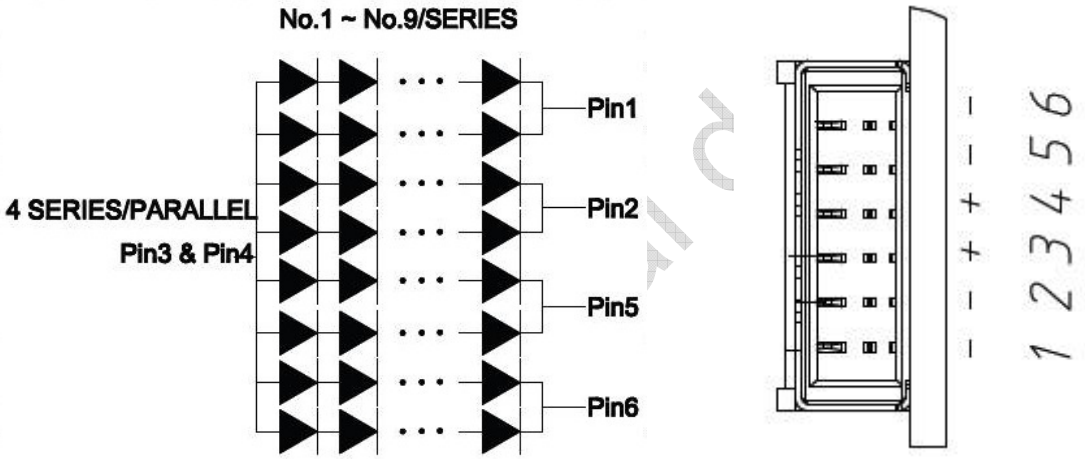
Note: All input signals shall be at low or Hi-Z state when V_{DD} is off.

Table 5 Backlight Connector Pin Assignment

Pin No.	Symbol	Description
1	IRLED1	LED current sense for string1
2	IRLED2	LED current sense for string2
3	VLED	LED power supply
4	VLED	LED power supply
5	IRLED3	LED current sense for string3
6	IRLED4	LED current sense for string4

Note:Backlight connector type is ENTERY 3707K-Q06N-01L.

Figure 5 LED Circuit Diagram and LED Connector



3.3 LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

Table 6 LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V_{th}	-	-	+100	mV	V_{cm}=+1.2V
Differential Input Low Threshold	V_{tl}	-100	-	-	mV	V_{cm}=+1.2V
Magnitude Differential Input	$\|V_{id}\|$	100	-	600	mV	-
Common Mode Voltage	V_{cm}	1.0	1.2	1.4	V	Vth-Vtl =200mV

Note:

(1)Input signals shall be at low or Hi-Z state when V_{DD} is off.

(2)All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

(3)All values are measured at condition of V_{DD} =5V and Ta=25℃.

Figure 6 Voltage Definitions

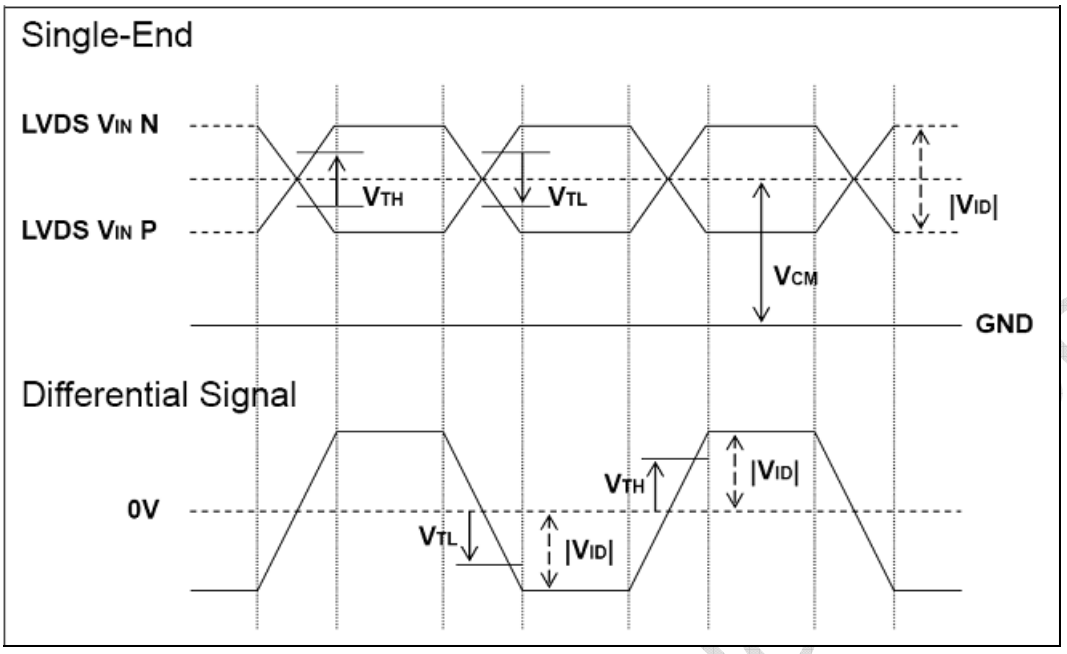


Figure 7 Measurement System

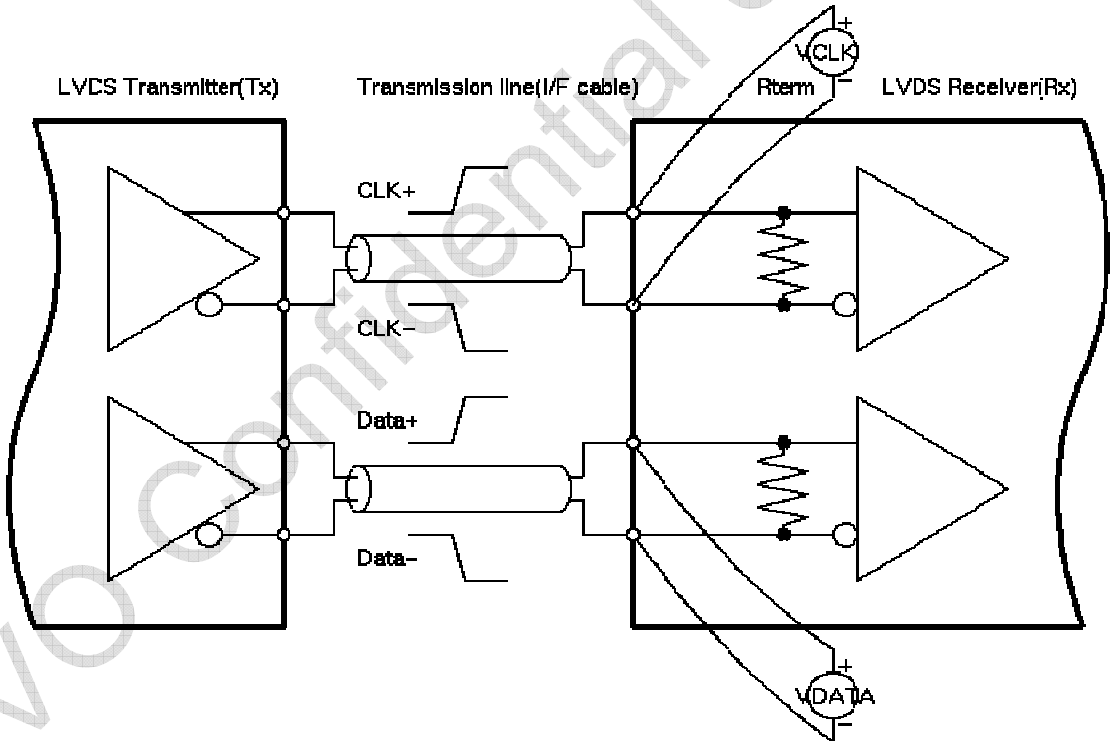
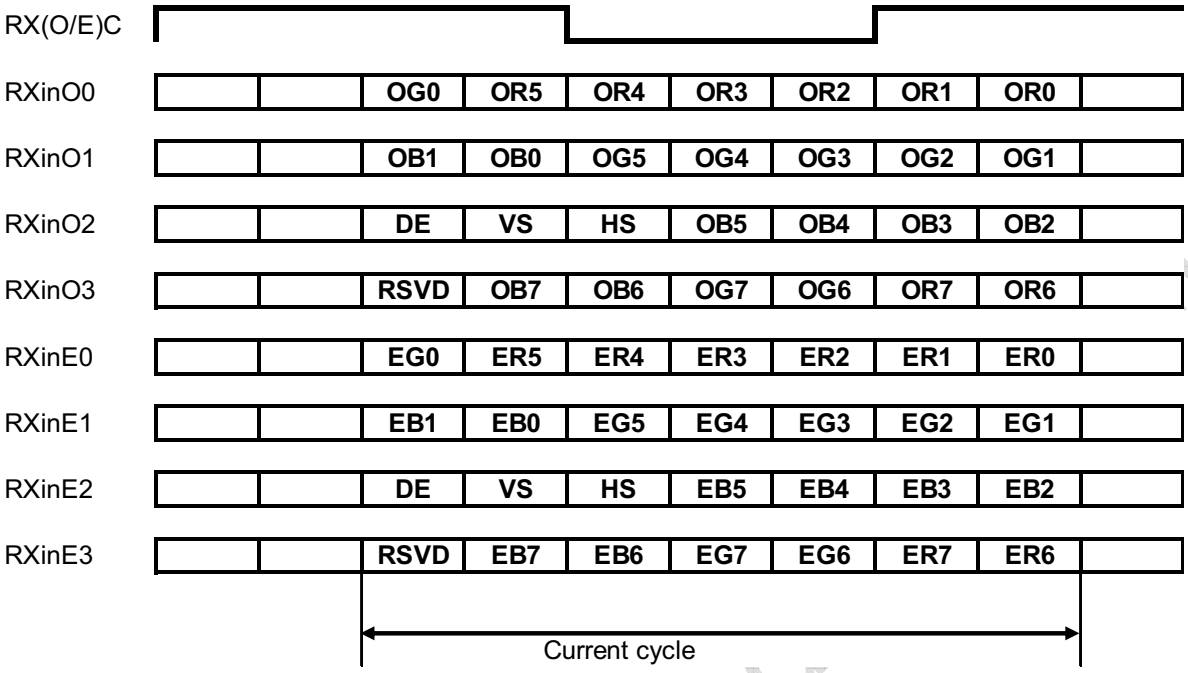


Figure 8 LVDS Data Mapping

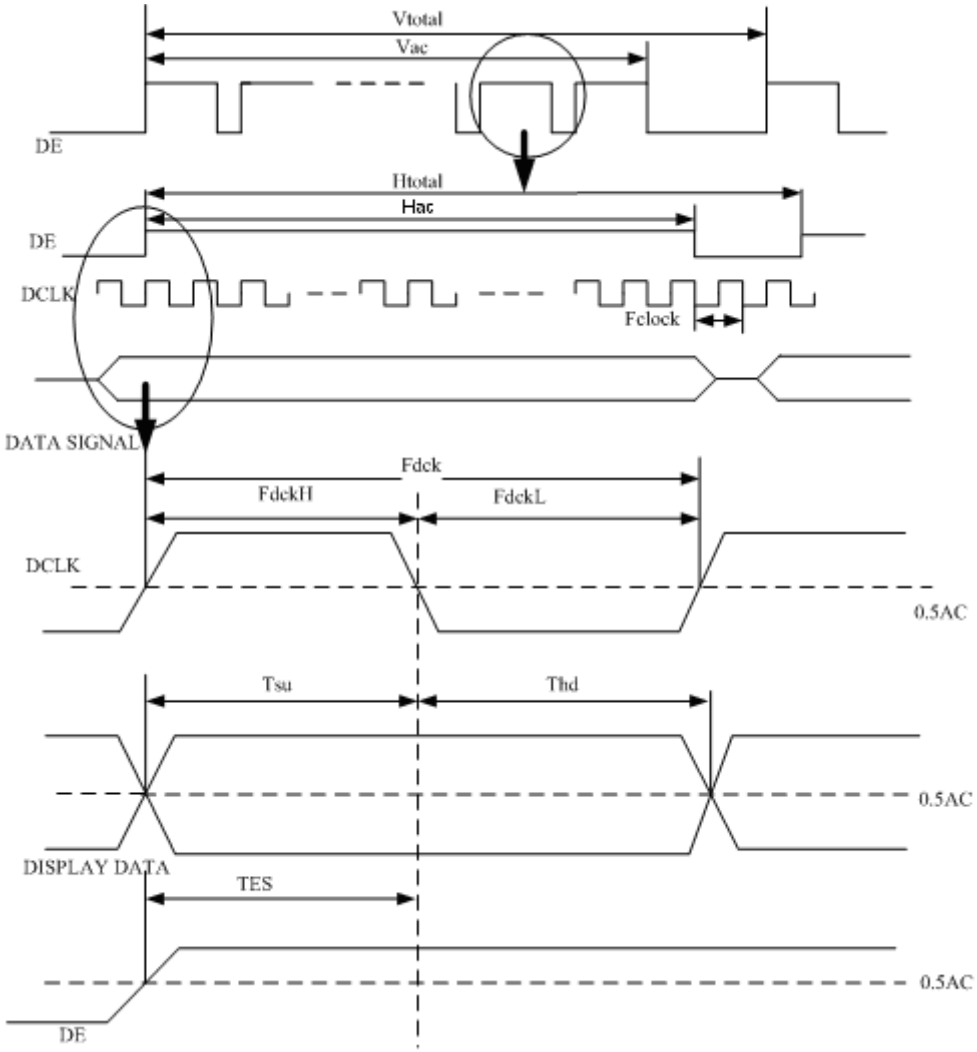


3.4 Interface Timings

Table 7 Interface Timings

Parameter	Symbol	Unit	Min.	Typ.	Max.
LVDS Clock Frequency(dual)	F_{dck}	MHz	57.8	73.3	96.7
H Total Time	H_{total}	Clocks	1,050	1,100	1,150
H Active Time	H_{ac}	Clocks	960	960	960
V Total Time	V_{total}	Lines	1,100	1,110	1,121
V Active Time	V_{ac}	Lines	1,080	1,080	1,080
Frame Rate	V_{sync}	Hz	50.0	60.0	75.0

Figure 9 Timing Characteristics



Note: TES is data enable signal setup time.

3.5 Power ON/OFF Sequence

V_{DD} power, interface signals, and lamp on/off sequence are showing on Figure 10.

Signals shall be Hi-Z state or low level when V_{DD} is off.

Figure 10

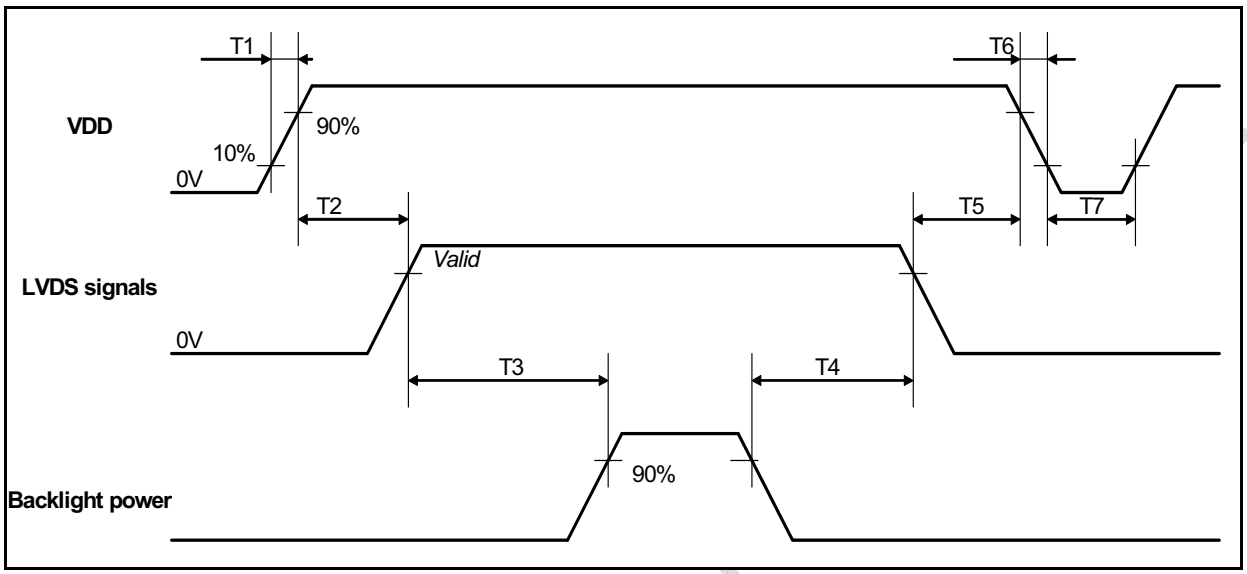


Table 8 Power Sequencing Requirements

Parameter	Symbol	Unit	Min.	Typ.	Max.
VDD Rise Time	T1	ms	0.5	-	10
VDD Good to Signal Valid	T2	ms	0	-	50
Signal Valid to Backlight On	T3	ms	200	-	450
Backlight Off to Signal Disable	T4	ms	200	-	450
Signal Disable to Power Down	T5	ms	0	-	50
VDD Fall Time	T6	ms	0	-	100
Power Off	T7	ms	500	-	-

4 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes.

Table 9 Optical Characteristics

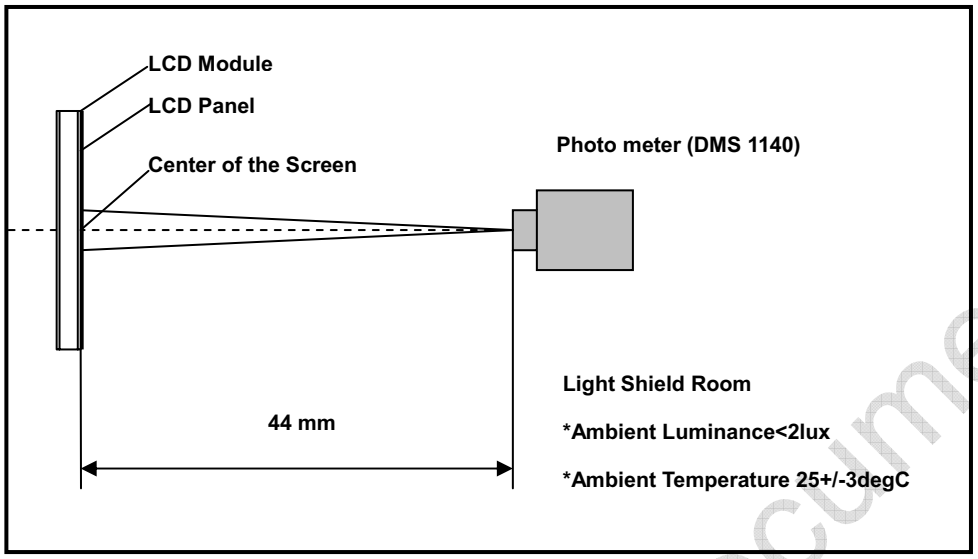
Item	Conditions		Specification				
			Min.	Typ.	Max.	Unit	Note
Viewing Angle [degrees] K=Contrast Ratio>10	Horizontal	θx- (Left)	75	85	-	Deg.	(1),(2)
		θx+ (Right)	75	85	-	Deg.	
	Vertical	θy+ (Up)	70	80	-	Deg.	
		θy- (Down)	70	80	-	Deg.	
Contrast Ratio	Center		600	1,000	-	-	(1),(3)
Response Time	Rising		-	1.3	-	ms	
	Falling		-	3.7	-	ms	
	Rising + Falling		-	5.0	8.0	ms	(1),(4)
Color Chromaticity (CIE1931)	Red x		Typ. -0.03	0.637	Typ. +0.03	-	(1)
	Red y			0.342		-	(1)
	Green x			0.313		-	(1)
	Green y			0.622		-	(1)
	Blue x			0.152		-	(1)
	Blue y			0.047		-	(1)
	White x			0.313		-	(1)
	White y			0.329		-	(1)
White Luminance	$I_{\_LED}$ =60mA		250	300		[cd/m^2]	(1),(5)
Luminance Uniformity	$I_{\_LED}$ =60mA, 9points		70	80	-	[%]	

Note:

(1)Measurement Setup

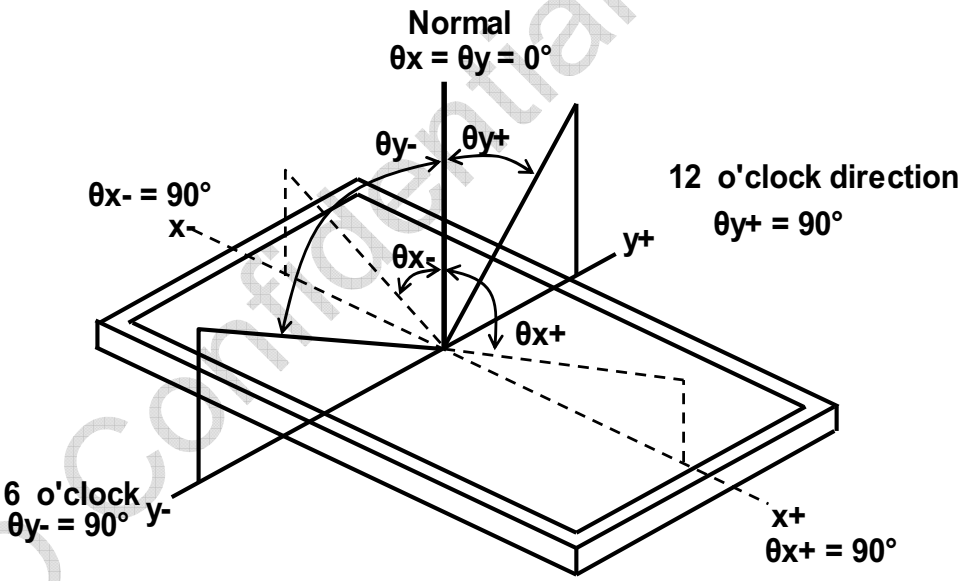
The LCD module should be stabilized at condition of I_F =60mA and Ta=25℃ for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in a windless room.

Figure 11 Measurement Setup



(2)Definition of Viewing Angle

Figure 12 Definition of Viewing Angle



(3)Definition of Contrast Ratio (CR)

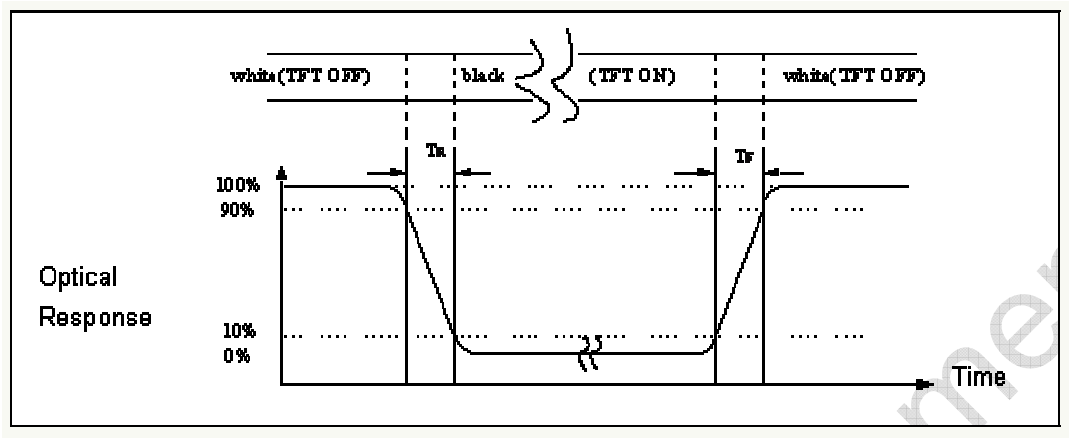
The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255, L0: Luminance of gray level 0

(4)Definition of Response Time (T_R, T_F)

Figure 13 Definition of Response Time

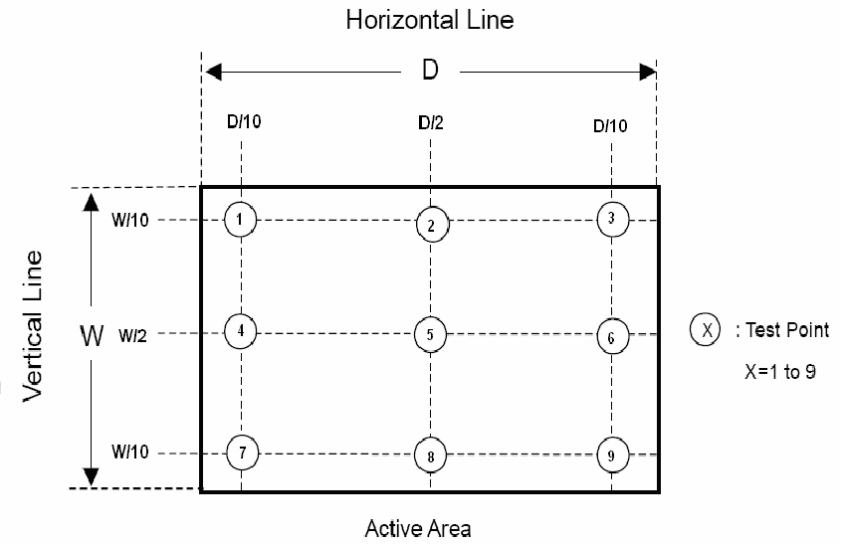


(5)Definition of White Luminance and Luminance Uniformity:

Measure the luminance of gray level 255 at point 5 (Fig.14).

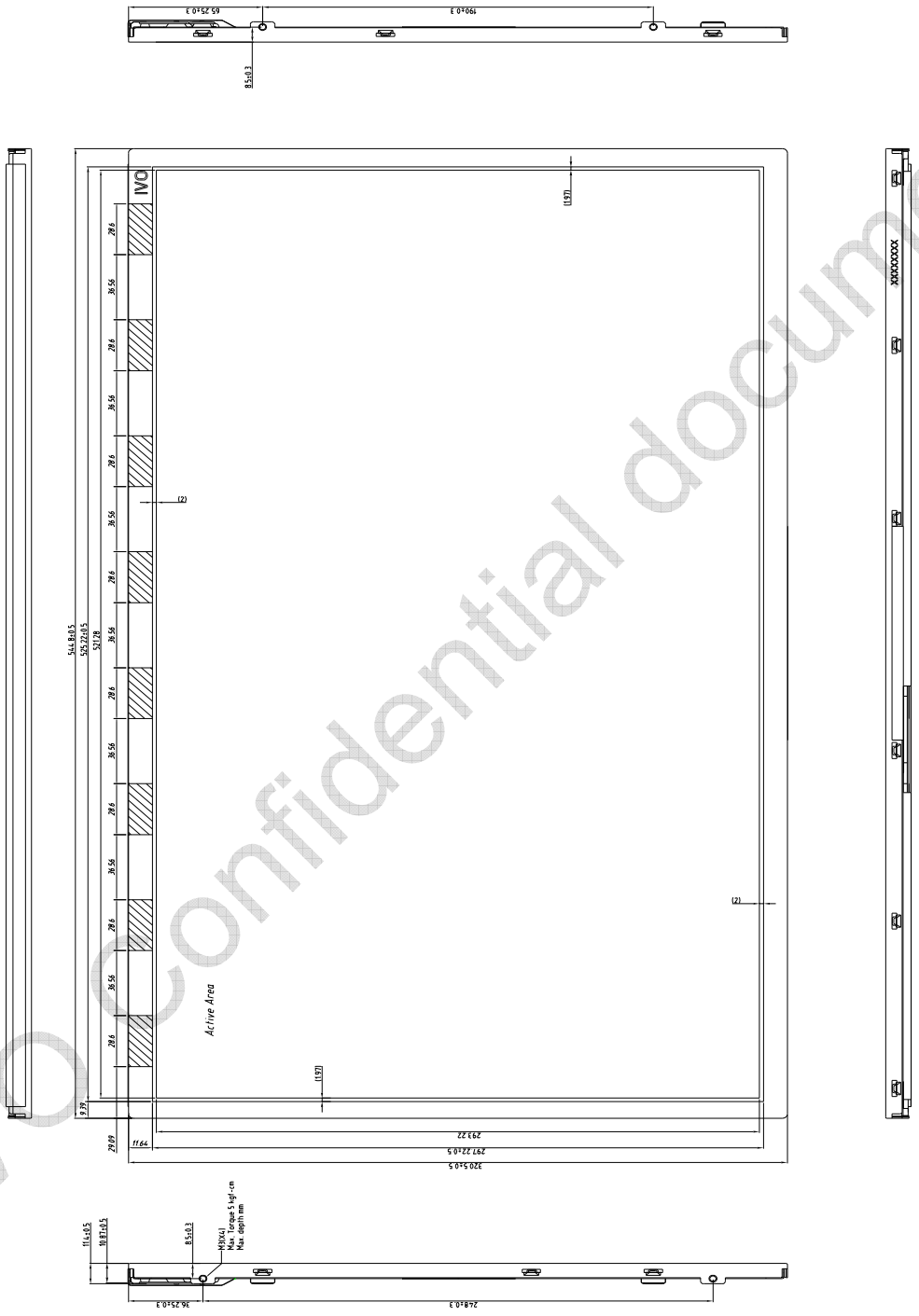
$$\text{Luminance Uniformity} = \frac{\text{Minimum Brightness of nine points (P1~P9)}}{\text{Maximum Brightness of nine points (P1~P9)}}$$

Figure 14 Measurement Locations of 9 Points



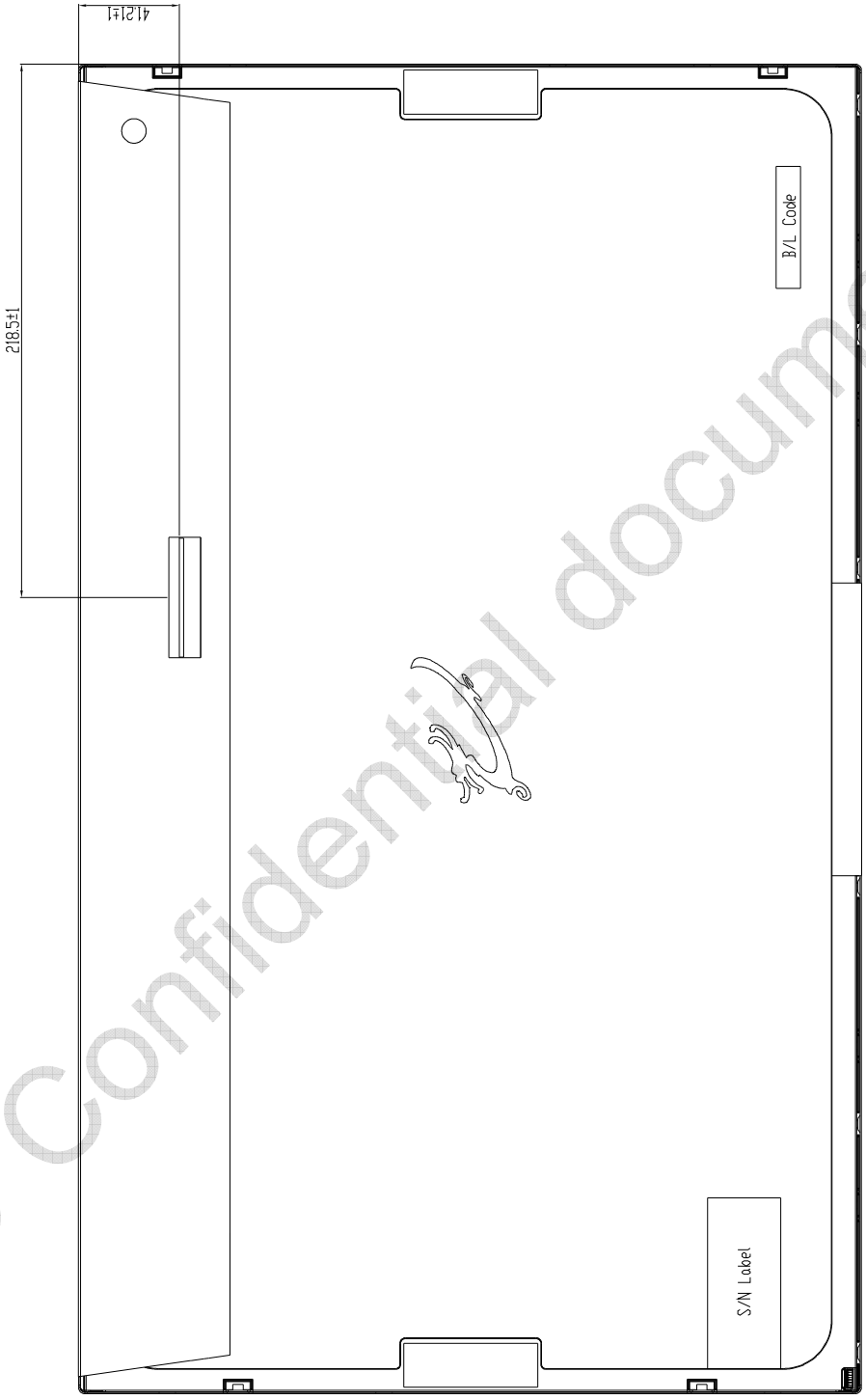
5 Mechanical Characteristics

Figure 15 Reference Outline Drawing (Front Side)



Notes:
1.Side mount hole torque spec:5Kg-cm(Max)
2.Screw length follow the notes in the drawing

Figure 16 Reference Outline Drawing (Back Side)

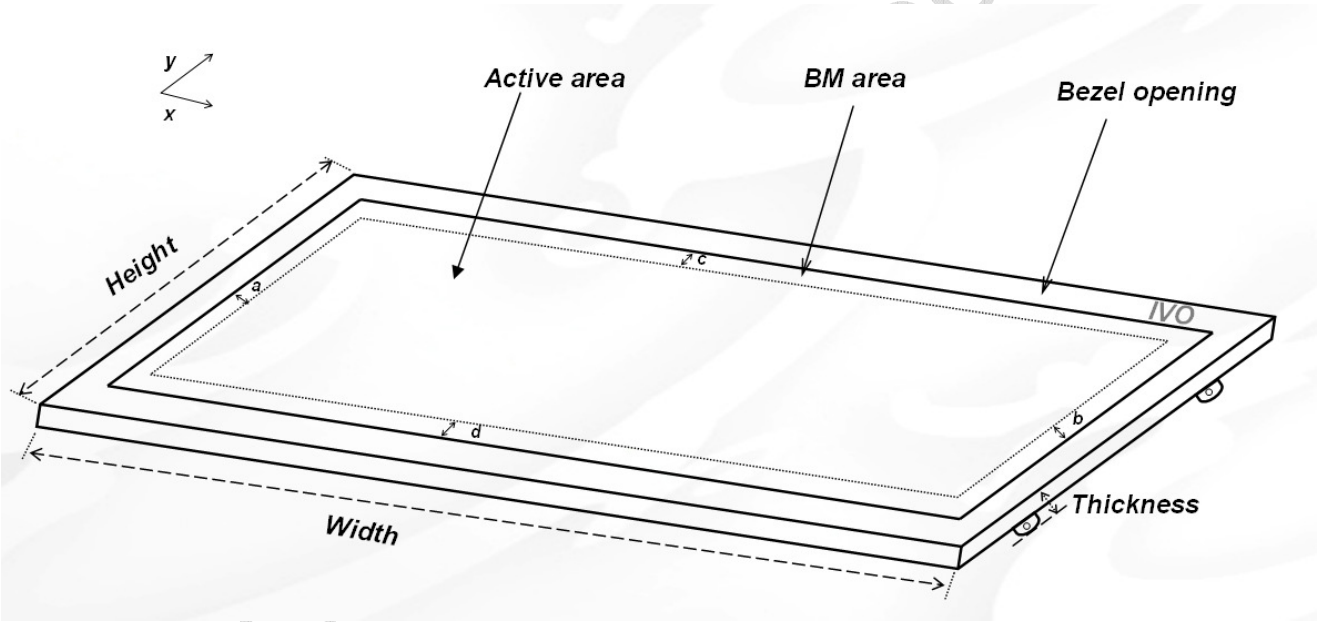


Note：The details of LED Connector refer to Figure 5.

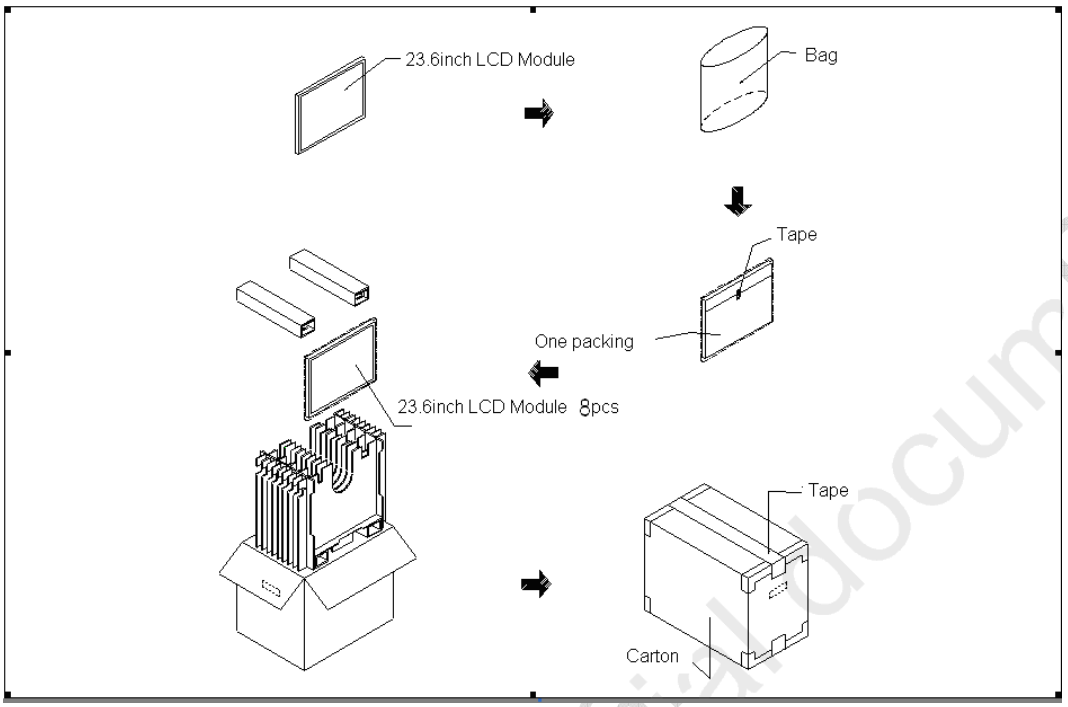
5.1 Dimension Specifications

Table 10

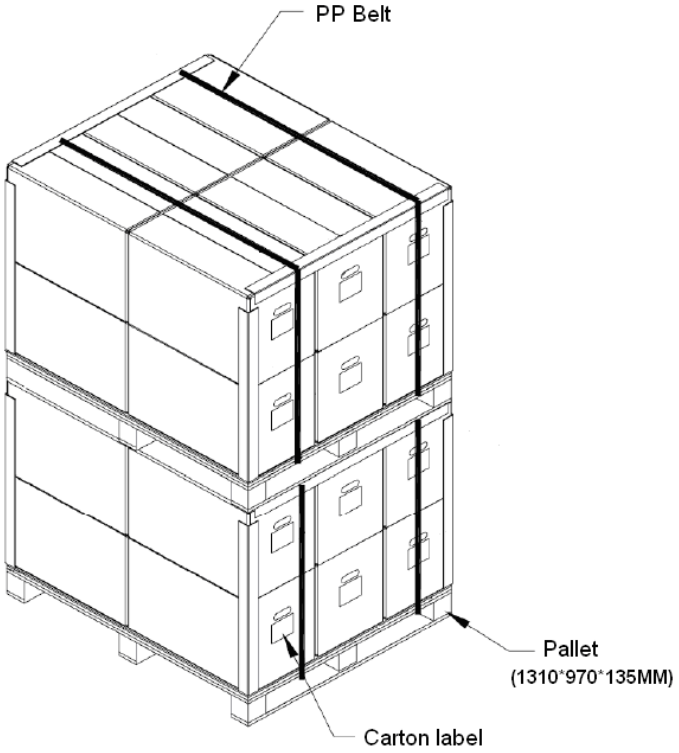
Item		Value	Unit
Width		544.8±0.5	mm
Height		320.5±0.5	mm
Thickness		11.4±0.5	mm
Bezel Opening	X	525.22±0.3	mm
	Y	297.22±0.3	mm
Weight（Max）		2,800	g
BM Width	|a-b| & |c-d|	≤1.0	mm



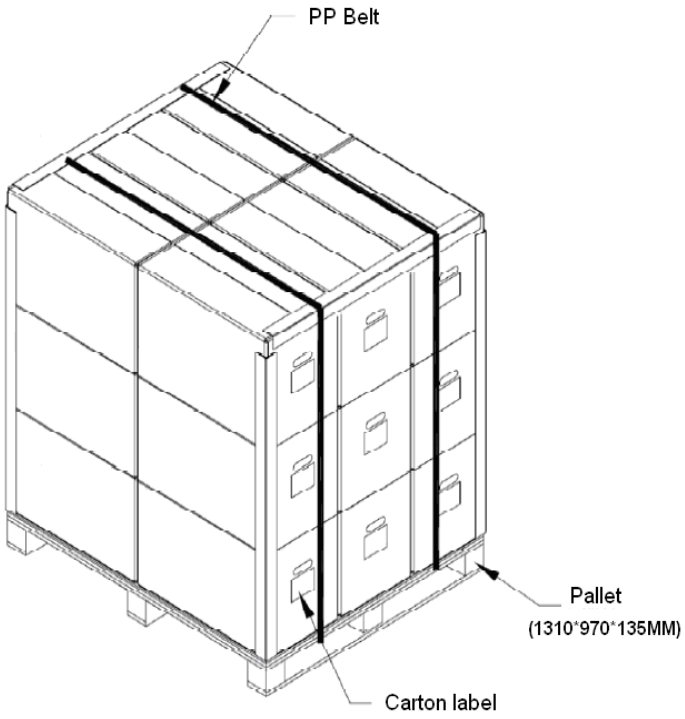
6 Package Specification



Sea Transportation



Air Transportation



7 Lot Mark

7.1 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Code 1,2,4,5,6,7,8,9,10,11,16: IVO internal flow control code.
Code 3: Production Location.
Code 12: Production Year.
Code 13: Production Month.
Code 14,15: Production Date.
Code 17,18,19,20: Serial Number.
Note (1) Production Year

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mark	6	7	8	9	A	B	C	D	E	F

Note (2) Production Month

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

7.2 23 product barcode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Code 1,2: MD Module Domain.
Code 3,4,5,6,7: IVO Internal Module Name.
Code 8,9,10,13,16: IVO Internal Flow Control Code.
Code 11,12: Cell location “Suzhou” is defined as “SZ”.
Code 14 ,15: Module line “kunshan” is defined as” KS”.
Code 17,18,19 : Year, Month, Day Refer to IVO Barcode Note(1),Note(2) in Page23.
Code 20~23 : Serial Number.

8 General Precaution

8.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

8.2 Handling Precaution

1) Please mount LCD module by using mounting holes arranged in four corners tightly.
2) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. IVO does not warrant the module, if customers disassemble or modify the module.
3) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin. If liquid crystal contacts mouth or eyes, rinse out with water immediately. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and Rinse thoroughly with water.
4) Disconnect power supply before handling LCD module.
5) Refrain from strong mechanical shock and /or any force to the module.
6) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature; etc otherwise LCD module may be damaged. It's recommended employing protection circuit for power supply.
7) Do not touch, push or rub the polarizer with anything harder than HB pencil lead. And please do not push the panel hard or rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
8) When the surface is dusty, please wipe gently with absorbent cotton or other soft Material. When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizer. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
9) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
10) Protection film must be removed very slowly from the surface of LCD module to prevent from electrostatic occurrence.
11) Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge, Please be careful with electrostatic discharge .Persons who handle the module should be grounded through adequate methods.
12) Do not adjust the variable resistor located on the module.

8.3 Storage Precaution

1) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
2) The module shall not be exposed under strong light such as direct sunlight. Otherwise, Display characteristics may be changed.
3) The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

8.4 Operation Precaution

1) Do not connect or disconnect the module in the "Power On" condition.
2) Power supply should always be turned on/off by "Power on/off sequence".

3) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

4) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

8.5 Others

1) Ultra-violet ray filter is necessary for outdoor operation.

2) Avoid condensation of water which may result in improper operation or disconnection of electrode.

3) If the module keeps displaying the same pattern for a long period of time, the image may be "Sticked" to the screen.

4) This module has its circuitry PCB on the rear side and should be handled carefully in order not to be stressed.

8.6 Disposal

When disposing LCD module, obey the local environmental regulations.